

THE SPECIES OF MONOGENOIDEA RECORDED FROM AUSTRALIAN FISHES AND NOTES ON THEIR ZOOGEOGRAPHY

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ABSTRACT

The Australian monogenoid fauna cannot be said to be particularly distinct from any other. The Solanderian representatives have most affinity with those found in the Indo-Australasian zoogeographical area and this is almost certainly a result of the specificity developed between the parasites and their hosts which are themselves related to the fishes of the Indo-Australasian area. The Flindersian and Peronian representatives show no special affinity to the Indo-Australasian monogenoid fauna and appear most closely related to that of other temperate forms presumably because of their related fish hosts.

RESUMEN

No es posible decir, de la fauna australiana de monogenoideos, que sea particularmente distinta de la de cualquier otra parte. Los representativos de los solanderianos tienen muchísima afinidad con los encontrados en el área zoogeográfica indoaustralasiática, y esto es casi seguramente el resultado de la especificidad desarrollada entre los parásitos y sus huéspedes, los cuales están ellos mismos relacionados con los peces del área indoaustralasiática. Los representativos flindersianos y peronianos no muestran especial afinidad con la fauna indoaustralasiática de monogenoideos y parecen estar muy íntimamente relacionados con los de otras formas de regiones templadas, a juzgar por sus relativos peces huéspedes.

The waters of Australia abound with differing species of fish; about 1,500 species of fish have been recorded from the marine and fresh waters of Queensland alone. Before the present author's studies only 15 species of Monogenoidea had been found parasitising these, and of these, only five were described from marine fishes, and none from the Great Barrier Reef. Other parts of the tropical coasts of Australia were totally neglected and from the whole of the Southern Temperate coastline and inland waterways of Western Australia, South Aus-

tralia, Victoria and New South Wales very few monogenoid species had been recorded. For this reason the author undertook the task of surveying a variety of Queensland fishes with the object of obtaining further information about their monogenoid parasites. The large numbers of new species that were found have been described elsewhere (Young 1967a, 1967b, 1967c, 1968a, 1968b, 1968c, 1968d, 1969), and where necessary the existing taxonomy was revised.

The survey was restricted mainly to Queensland marine fishes and because

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of the impressive and totally uninvestigated fish fauna of the Great Barrier Reef most emphasis was placed on obtaining specimens from there. The areas from which fish were investigated were: Heron Island, Capricorn Group, 400 miles north of Brisbane and 40 miles out to sea, which is a small coral cay about half a mile long but with a reef extending 5 by 3 miles; Green Island, some ten miles out from Cairns, which is 1,500 miles north of Brisbane, where the reef is not as extensive, but there is also a large tropical fish fauna; and Moreton Bay, the somewhat muddy estuary of the Brisbane River, in which most beaches consist of Mangrove swamps although some coral is found on the outer islands.

To obtain a clear taxonomic picture of some of the groups additional monogenoids were collected from some freshwater fishes. The localities from which

these were obtained were: the Macintyre River at Goondiwindi, Queensland, situated about 400 miles west of Brisbane; the Atherton Tableland, North Queensland, situated some 1,000 miles north of Brisbane; and the Enoggera Reservoir, Brisbane. Additional marine species were given to the author from South Australia by Dr. H. Manter.¹

The types of all new species described by the author have been deposited in the United States National Museum at Washington. However some paratypes, new records and duplicate specimens have been lodged in the Queensland Museum, Brisbane, Queensland.

The following list incorporates the results of the survey of selected Australian fishes during 1963 to 1965 and includes all previously recorded species together with the host, locality, and authority.

DACTYLOGYRIDAE Bychowsky, 1933
ANCYROCEPHALINAE Bychowsky, 1937

Ancyrocephalus Creplin, 1839

1. *A. bassensis* Hughes, 1928

Hughes (1928) on *Platycephalus bassensis* Cuv. and Val. (Platycephalidae) from Port Philip Bay, Victoria.

Murray (1931) on *Platycephalus bassensis* Cuv. and Val. (Platycephalidae) from Port Philip Bay, Victoria.

2. *A. vesiculosus* Murray, 1931

Murray (1931) on *Platycephalus bassensis* Cuv. and Val. (Platycephalidae) from Port Philip Bay, Victoria.

Ancylodiscus Johnston and Tiegs, 1922

3. *A. gadopsis* Hughes, 1928

Hughes (1928) on *Gadopsis* sp. (Gadopsidae) from Campaspe River, Victoria.

4. *A. tandani* Johnston and Tiegs, 1922

Johnston and Tiegs (1922) on *Tandanus*

1. University of Nebraska, USA.

* = New record.

tandanus Mitchell (Plotosidae) from Burnett River, Queensland.

Murray (1931) on *Tandanus tandanus* Mitchell (Plotosidae) from Murray River, Victoria.

* New record on *Tandanus tandanus* Mitchell (Plotosidae) from Macintyre River and Enoggera Reservoir, Brisbane, Queensland.

Cleithrarticus Mizelle, 1963

5. *C. cleithrarticus* Mizelle, 1963

Young (1968b) on *Acanthurus dussumieri* Cuv. and Val. (Acanthuridae) and *A. mata* (Cuv.) from Heron Island, Queensland; on *A. xanthopterus* Cuv. and Val. (Acanthuridae) from Green Island, Queensland.

Datreosoma Johnston and Tiegs, 1922

6. *D. constrictum* Johnston and Tiegs, 1922

Johnston and Tiegs (1922) on *Therapion carbo* Ogilby and McCulloch (*Therapo-*

- nidae) from Thompson River, Queensland.
7. *D. bancrofti* Johnston and Tiegs, 1922
Johnston and Tiegs, (1922) on *Therapon hilli* Castelnau (Theraponidae) from Thompson River, Queensland.
- Empleurosomata* Johnston and Tiegs, 1922
8. *E. pyriforme* Johnston and Tiegs, 1922
Johnston and Tiegs (1922) on *Therapon unicolor* Günther (Theraponidae) from Burnett River, Queensland.
- Haliotrema* Johnston and Tiegs, 1922
9. *H. australis* Johnston and Tiegs, 1922
Johnston and Tiegs (1922) on *Upeneus signatus* Günther (Mullidae) from Moreton Bay, Queensland.
10. *H. dempsteri* (Mizelle and Price, 1964)
Young, 1968
Young (1968a) on *Acanthurus mata* (Cuv.) *A. dussumieri* (Cuv. and Val.) and *A. xanthopterus* (Cuv. and Val.) from Heron Island, Queensland; on *A. xanphopterus* (Cuv. and Val.) (Acanthuridae). from Green Island, Queensland.
11. *H. ctenochaeti* Young, 1968
Young (1968a) on *Ctenochaetus strigosus* (Bennett) (Acanthuridae) from Heron Island, Queensland.
12. *H. falcanalis* Young, 1968
Young (1968a) on *Triacanthus falcanalis* Ogilby (Triacanthidae) from Moreton Bay, Queensland.
13. *H. lineati* Young, 1968
Young (1968a) on *Acanthurus lineatus* (L.) (Acanthuridae) from Moreton Bay, Queensland.
14. *H. parahaliotrema* (Mizelle and Price, 1964)
Young, 1968
Young (1968a) on *Zebrasoma veliferum* (Bloch) (Acanthuridae) and *Acanthurus grammoptilus* Richardson (Acanthuridae) from Heron Island, Queensland.
15. *H. johni* (Tripathi, 1959) Young, 1968
Young (1968a) on *Lutjanus johni* (Bloch) (Lutjanidae) from Green Island, Queensland and *L. fulviflamma* (Forsk.) (Lutjanidae) from Heron Island, Queensland.
16. *H. chrysotaeniae* Young, 1968
Young (1968a) on *Lutjanus chrysotaenia* (Bleeker) (Lutjanidae) from Heron Island, Queensland.
17. *H. cromileptis* Young, 1968
Young (1968a) on *Cromileptes altivelis* (Cuv. and Val.) (Serranidae) from Heron Island, Queensland.
18. *H. epinepheli* Young, 1968
Young (1968a) on *Epinephelus fasciatus* (Forsk.) (Serranidae) and *E. merra* from Heron Island, Queensland.
19. *H. holocentri* Young, 1968
Young (1968a) on *Holocentrus ruber* (Forsk.) (Holocentridae) from Heron Island, Queensland.
20. *H. chrysostomi* Young, 1968
Young (1968a) on *Lethrinus chrysostomus* Richardson (Lethrinidae) and *Plectorhinchus pictus* (Thunberg) (Lethrinidae) from Heron Island, Queensland.
21. *H. fleti* Young, 1968
Young (1968a) on *Lethrinus fletus* Whitley (Lethrinidae) and *L. chrysostomus* Richardson (Lethrinidae) from Moreton Bay, Queensland.
22. *H. obesa* (Caballero, Bravo-Hollis y Grocott, 1955) Young, 1968
Young (1968a) on *Tetraodon hispidus* L. (Tetraodontidae) from Green Island, Queensland.
23. *H. scari* Young, 1968
Young (1968a) on *Scarus fasciatus* Cuv. and Val. (Scaridae) from Heron Island, Queensland.
- Hamatopeduncularia* Yamaguti, 1953
24. *H. australis* Young, 1967
Young (1967a) on *Neoarius australis* (Günther) (Ariidae) from Brisbane River (tidal part), Queensland.
25. *H. brisbanensis* Young, 1967
Young (1967a) on *Neoarius australis* (Günther) (Ariidae) from Brisbane River (tidal part) and Moreton Bay, Queensland.
- Isohaliotrema* Young, 1968
26. *I. placatis* Young, 1968

Young (1968b) on *Platax pinnatus* (L.) (Platacidæ) from Moreton Bay, Queensland.

Murraytrema Price, 1937

27. *M. robusta* (Murray, 1931) Price, 1937

Murray (1931) on *Sparus australis* (Sparidae) from Werribee River, Victoria.

Nasobranchitrema Yamaguti, 1965

28. *N. pacificum* Yamaguti, 1965

Young (1968b) on *Naso annulatus* (Quoy and Gaimard) (Acanthuridae) from Heron Island, Queensland.

Pseudohaliotrema Yamaguti, 1953

29. *P. thysanophryidis* (Yamaguti, 1965) Young, 1968

Young (1968b) on *Platycephalus fuscus* (Cuv. and Val.) (Platycephalidae) from Moreton Bay, Queensland.

30. *P. platycephali* (Yin and Sproston, 1948)

Young, 1968

Young (1968b) on *Platycephalus indicus* (L.) *P. fuscus* (Cuv. and Val.) and *Platycephalus* sp. (Platycephalidae), from Moreton Bay, Queensland.

Tetrancistrum Goto and Kikuchi, 1917

31. *T. fusiforme* (Yamaguti, 1953) Young, 1967

Young (1967b) on *Siganus lineatus* (Val.) (Siganidae) from Green Island and Heron Island, Queensland and on *Acanthurus xanthopterus* Val. (Acanthuridae) from Green Island, Queensland.

32. *T. nasonis* Young, 1967

Young (1967b) on *Naso annulatus* (Quoy and Gaimard) (Acanthuridae) from Heron Island, Queensland.

33. *T. nebulosi* Young, 1967

Young (1967b) on *Siganus nebulosus* (Quoy and Gaimard) (Siganidae) from *oramin* (Bloch and Schneider) (Siganidae) from Heron Island, Queensland.

34. *T. oraminii* Young, 1967

Young (1967b) on *Siganus oramin*

(Bloch and Schneider) (Siganidae) from Heron Island, Queensland.

HAREOCEPHALINAE Young, 1968

Hareocephalus Young, 1968

35. *H. thaisae* Young, 1968

Young (1968b) on *Tylosaurus macleayanus* (Ogilby) (Tylosauridae) from Moreton Bay, Queensland.

PROTOGYRODACTYLIDAE Johnston y Tiegs, 1922

Protogyrodactylus Johnston and Tiegs, 1922

36. *P. quadratus* Johnston and Tiegs, 1922

Johnston and Tiegs (1922) on *Therapon carpon* Ogilby y McCulloch (Theraponidae) and *T. hilli* Castelnau (Theraponidae) from Thompson River at Longreach, Queensland.

Trivitellina Johnston and Tiegs, 1922

37. *T. subrotunda* Johnston and Tiegs, 1922

Johnston y Tiegs (1922) on *Therapon fuliginosus* (Theraponidae) from the Thompson River at Longreach, Queensland.

CALCEOSTOMATIDAE Parona e Perugia, 1890; emend Poche, 1926

Calceostoma van Beneden, 1858

38. *C. glandulosum* Johnston and Tiegs, 1922

Johnston and Tiegs (1922) on *Sciaena antartica* (Castelnau) (Sciaenidae) from Caloundra, Queensland.

* New record on *Sciaena antartica* (Castelnau) (Sciaenidae) from Adelaide, S. Australia.

DIPLECTANIDAE Bychowsky, 1957

Diplectanum Diesing, 1858

39. *D. cupatum* Young, 1969

Young (1969) on *Epinephelus merra* Bloch (Serranidae) and *E. fasciatus*

- (Forsk.) (Serranidae) from Heron Island, Queensland.
40. *D. fluviatilis* (Johnston and Tiegs, 1922) Price, 1937
 Johnston and Tiegs (1922) on *Plectroplites ambiguus* (Richardson) (Serranidae) from Thompson River, Longreach, Queensland.
 Murray (1931) on *Plectroplites ambiguus* (Richardson) (Serranidae) from Murray River, Victoria.
 Young (1969) on *Plectroplites ambiguus* (Richardson) (Serranidae) from Macintyre River, Goondiwiindi, Queensland.
41. *D. plectropomi* Young, 1969
 Young (1969) on *Plectropomus maculatus* (Bloch) (Serranidae) from Heron Island, Queensland.
42. *D. summanae* Young, 1969
 Young (1969) on *Epinephelus summanae* (Serranidae) from Heron Island, Queensland.
43. *D. vagampullum* Young, 1969
 Young (1969) on *Epinephelus merra* Bloch (Serranidae) from Heron Island, Queensland.
- Acleotrema* Johnston and Tiegs, 1922
44. *A. gibsoni* Johnston and Tiegs, 1922
 Johnston and Tiegs (1922) on *Girella tricuspidata* (Quoy y Gaimard) (Kyphosidae) from Caloundra, Queensland.
45. *A heronensis* Young, 1969
 Young (1969) on *Kyphosis cinerascens* (Forsk.) (Kyphosidae) and *K. gibsoni* (Kyphosidae) from Heron Island, Queensland.
- Calydiscoides* Young, 1969
46. *C. australis* Young, 1969
 Young (1969) on *Lethrinus chrysostomus* Richardson (Lethrinidae) from Heron Island, Queensland.
47. *C. difficilis* (Yamaguti, 1953) Young, 1969
 Young (1969) on *Lethrinus fletus* Whitley (Lethrinidae) and *Lethrinus reticulatus* Val. (Lethrinidae) from Green Island and Moreton Bay, Queensland.
- Lamellodiscus* Johnston and Tiegs, 1922
48. *L. typicus* Johnston and Tiegs, 1922
 Johnston and Tiegs (1922) in *Sparus australis* Günther (Sparidae) from Moreton Bay, Queensland.
49. *L. mayor* Murray, 1931
 Murray (1931) on *Sparus australis* (Sparidae) from Werribee River, Victoria.
50. *L. pagrosomi* Murray, 1931
 Murray (1931) on *Pagrosomus auratus* (Sparidae) from Port Philip Bay, Victoria.
 Young (1969) on *Chrysophrys auratus* (Bloch y Schneider) (Sparidae) from Moreton Bay, Queensland.
- Lepidotrema* Johnston and Tiegs, 1922
51. *L. therapon* Johnston and Tiegs, 1922
 Johnston and Tiegs (1922) on *Therapon carbo* Ogilby y McCulloch (Therapontidae) from the Thompson River, Longreach, Queensland.
52. *L. angusta* (Johnston and Tiegs, 1922)
 Johnston and Tiegs (1922) on *Therapon unicolor* Günther (Therapontidae) from Burnett River, Queensland.
 Young (1969) on *Therapon unicolor* Günther (Therapontidae) from Macintyre River, Goondiwiindi, Queensland.
53. *L. bidyna* Murray, 1931
 Murray (1931) on *Therapon bidyna* (Mitchell) (Therapontidae) from Murray River, Victoria.
 Young (1969) on *Therapon bidyna* (Mitchell) (Therapontidae) from Macintyre River, Goondiwiindi, Queensland.
54. *L. fuliginosa* Johnston and Tiegs, 1922
 Price, 1937
 Johnston and Tiegs (1922) on *Therapon fuliginosus* Macleay (Therapontidae) from Thompson River, Longreach, Queensland.
55. *L. simplex* (Johnston and Tiegs, 1922) Price, 1937
 Johnston and Tiegs (1922) on *Therapon fuliginosus* Macleay (Therapontidae) from Thompson River, Longreach, Queensland.
56. *L. tenue* Johnston and Tiegs, 1922
 Johnston and Tiegs (1922) on *Therapon hilli* Castelnau (Therapontidae) from

- Thompson River, Longreach, Queensland.
- Young (1969) on *Therapon hilli* Castelnau (Theraponidae) from Atherton Tableland, Queensland.
- Latericaecum* Young, 1969
57. *L. pearsoni* Young, 1969
Young (1969) on *Sphyraena obtusata* Cuv. and Val. (Sphyraenidae) from Moreton Bay, Queensland.
- Monoplectanum* Young, 1969
58. *M. australis* Young, 1969
Young (1969) on *Sillago ciliata* Cuv. and Val. (Sillaginidae) from Moreton Bay, Queensland.
- MONOCOTYLIDAE Taschenber, 1897
- MONOCOTYLINAE Gamble, 1896
- Monocotyle* Taschenberg, 1896
59. *M. granulatae* Young, 1967
Young (1967c) on *Dasyatis granulata* (Macleay) (Dasyatidae) from Moreton Bay, Queensland.
60. *M. kuhlii* Young, 1967
Young (1967c) on *Dasyatis kuhli* (Macleay) (Dasyatidae) from Moreton Bay, Queensland.
61. *M. tritestis* Young, 1967
Young (1967c) on *Dasyatis kuhli* (Macleay) (Dasyatidae) from Moreton Bay, Queensland.
- Decacotyle* Young, 1967
62. *D. lymnae* Young, 1967
Young (1967c) on *Taeniura lymma* (Forsk.) (Dasyatidae) from Heron Island, Queensland.
- Heterocotyle* Scott, 1904
63. *H. granulatae* Young, 1967
Young (1967c) on *Dasyatis granulata* (Macleay) (Dasyatidae) from Moreton Bay, Queensland.
64. *H. robusta* (Johnston and Tiegs, 1922)
Price, 1938
Johnston and Tiegs (1922) on *Urolo-*
- phus testaceus* (Müller and Henle) (Dasyatidae) from Sydney, New South Wales.
- Horricauda* Tripathi, 1957
65. *H. rhinobatidis* Young, 1967
Young (1967c) on *Rhinobatos typus* Bennett (Rhinobatidae) from Heron Island, Queensland.
- Papillicotyle* Young, 1967
66. *P. octona* Young, 1967
Young (1967c) on *Aetobatis narinari* (Euphrasen) (Aetobatidae) from Heron Island, Queensland.
- Troglecephalus* Young, 1967
67. *T. rhinobatidis* Young, 1967
Young (1967c) on *Rhinobatos typus* Bennett (Rhinobatidae) from Heron Island, Queensland.
- DENDROMONOCOTYLINAE Hargis, 1955
- Dendromonocotyle* Hargis, 1955
68. *D. kuhlii* Young, 1967
Young (1967c) on *Dasyatis kuhli* (Müller y Henle) (Dasyatidae) from Moreton Bay, Queensland.
- Clemacotyle* Young, 1967
69. *C. australis* Young, 1967
Young (1967c) on *Aetobatis narinari* (Euphrasen) (Aetobatidae) from Heron Island, Queensland.
- CALICOTYLINAE Monticelli, 1903
- Calicotyle* Diesing, 1850
70. *C. australis* Johnston, 1934
Johnston (1934) in *Trygonorrhina fasciata* Müller y Henle (Rhinobatidae) from Glenelg, S. Australia.
* New record in *Aptychotrema banksii* (Müller y Henle) from Moreton Bay, Queensland.
- GYMNOCALICOTYLE (NYBELIN, 1941)
YAMAGUTI, 1963

71. *G. inermis* (Woolcock, 1936) Yamaguti, 1963

Woolcock (1936) on *Pristiophorus cirratus* (Pristidae) from Port Philip Bay, Victoria.

HEXABOTHRIIDAE Price, 1942

- Erpocotyle* Beneden and Hesse, 1863

72. *E. antarctica* (Hughes, 1928) Price, 1942

Hughes (1928) on *Mustelus antarcticus* (Galeidae) from Port Philip Bay, Victoria.

DIONCHIDAE Bychowsky, 1957

- Dionchus* Goto, 1899

73. *D. remorae* (MacCullum, 1916) Price, 1938

* New record on *Echeneis naucrates* L. (Echeneidae) from Heron Island, Queensland.

74. *D. rachycentris* Hargis, 1955

* New record on *Rachycentron canadus* (L.) (Rachycentridae) from Moreton Bay, Queensland.

MICROBOTHRIIDAE Price, 1936

MICROBOTHRIINAE Price, 1938

- Pseudoleptobothrium* Young, 1967

75. *P. aptychotremae* Young, 1967

Young (1967a) on *Aptychotrema banksi* (Müller y Henle) (Rhinobatidae) from Moreton Bay, Queensland.

CAPSALIDAE Baird, 1853

CAPSALINAE Johnston, 1929

- Caballerocotyla* Price, 1960

76. *C. foliacea* (Goto, 1894) Price, 1960

* New record on *Kishinoella tongol* (Bleeker) (Thunnidae) from Green Island, Queensland.

77. *C. klawei* Stunkard, 1962

* New record on *Thunnus* sp. (Thunnidae) from Heron Island, Queensland.

78. *C. manteri* (Price, 1951) Price, 1960

* New record on *Euthunnus alletteratus* (Rafinesque) (Thunnidae) from Green Island, Queensland.

BENEDENIINAE Johnston, 1931

- Dioncopseudobenedenia* Yamaguti, 1965

79. *D. kala* Yamaguti, 1965

* New record on *Naso annulatus* (Quoy y Gaimard) (Acanthuridae) from Heron Island, Queensland.

ENCOTYLLABINAE Monticelli, 1892

- Encotylabe* Diesing, 1850

80. *E. pagrosomi* MacCullum, 1917

MacCullum (1917) on *Pagrosomus australis* (Sparidae) from Sydney, New South Wales.

81. *E. caranxi* Lebedev, 1967

Lebedev (1967) on *Caranx lutescens* (Carangidae) from the Great Australian Bight and Tasman Sea.

82. *E. latridis* Lebedev, 1967

Lebedev (1967) on *Latriss forsteri* (Latridae) from the Tasman Sea.

TROCHOPODINAE Price, 1936;

emend: Sproston, 1946

- Macrohillida* Johnston, 1929

83. *M. antartica* (Hughes, 1928) Johnston, 1929

Hughes (1928) on *Mustelus antarcticus* (Carcharinidae) from Port Philip Bay, Victoria.

- Megalocotyle* Folda, 1929

84. *M. helicoleni* Woolcock, 1936

Woolcock (1936) on *Helicolenus percoides* (Scorpaenidae) from Port Philip Bay, Victoria.

DIPLASIOTYLIDAE Hargis y Dillon,

1965

- Diplasiocotyle* Sandars, 1944

85. *D. johnstoni* Sandars, 1944

- Sandars (1944) on *Agonostomus forsteri* Cuv. y Val. (Mugilidae) from Mandurah and Bunbury, W. Australia.
- Hargis and Dillon (1965) on *Aldrichetta forsteri* (Cuv. and Val.) (Mugilidae) from Adelaide, S. Australia; Port Kennedy, S. Australia; Bunbury, W. Australia.
- MICROCOTYLIDAE Taschenberg, 1879**
- Microcotyle* Beneden y Hess, 1863
86. *M. agonostomi* Sandars, 1945
Sandars (1945) on *Agonostomus forsteri* (Mugilidae) from Swan River, Mandurah, Bunbury, Denmark and Albany, W. Australia.
87. *M. arripis* Sandars, 1945
Sandars (1945) on *Arripis georgianus* (Arripedae) from North Beach, Swan River, Mandurah, Bunbury, Busselton, Albany, Woodman Point, Scarborough, and Whitford's Beach, W. Australia.
88. *M. australis* Murray, 1931
Murray (1931) on *Sparus australis* (Sparidae) from Werribee River Victoria.
89. *M. bassensis* Murray, 1931
Murray (1931) on *Platycephalus bassensis* (Platycephalidae) from Port Philip Bay, Victoria.
90. *M. gerres* Sandars, 1944
Sandars (1944) on *Gerres ovatus* Waite (Gerridae) from Mandurah, W. Australia.
91. *M. helotis* Sandars, 1944
Sandars (1944) on *Helotes sexlineatus* Quoy y Gaimard (Theraponidae) from Swan River at Nedlands, Rockingham, Safety Bay, W. Australia.
92. *M. odacis* Sandars, 1945
Sandars (1945) on *Odax semifasciatus* (Odacidae) from Albany, W. Australia.
93. *M. pagrosomi* Murray, 1931
Murray (1931) on *Pagrosomus auratus* (Sparidae) from Port Philip Bay, Victoria.
94. *M. parsillaginiae* Sandars, 1945
Sandars (1945) on *Sillaginoides punctatus* (Sillaginidae) from Albany, Mandurah, W. Australia.
95. *M. pentapodi* Sandars, 1944
Sandars (1944) on *Pentapodus milii* (Bory St. Vinc.) (Lethrinidae) from Rockingham, W. Australia.
96. *M. pomatomi* Goto, 1899
* New record on *Pomatodus saltatrix* (Pomatomidae) from Moreton Bay, Queensland.
97. *M. sciaenae* Murray, 1931
Murray (1931) on *Sciaena antarctica* (Castelnau) (Sciaenidae) from Moreton Bay, Queensland.
98. *M. scorpis* Sandars, 1944
Sandars (1944) on *Scorpius aequipinnis* Richardson (Scorpidae) from Safety Bay, W. Australia.
99. *M. temnodontis* Sandars, 1945
Sandars (1945) on *Temnodon saltator* (Pomatomidae) from Mandurah, Albany, Swan River and Bunbury, W. Australia.
100. *M. victoriae* Woolcock, 1936
Woolcock (1936) on *Helicolensis percoidea* (Scorpaenidae) from Port Philip Bay, Victoria.
- Bivagina* Yamaguti, 1963
101. *B. sillaginiae* (Woolcock, 1936) Yamaguti, 1963
Woolcock (1936) on *Sillaginoides punctatus* (Sillaginidae) from Port Philip Bay, Victoria.
* New record on *Sillago ciliata* Cuv. y Val. (Sillaginidae) from Moreton Bay, Queensland.
- Aspinatrium* Yamaguti, 1963
102. *A. spari* (Yamaguti, 1963) comb. nov.
* New record on *Chrysophrys auratus* (Bloch y Schneider) (Sparidae) from Moreton Bay, Queensland.
- Metamicrocotyle* Yamaguti, 1953
103. *M. macracantha* (Alexander, 1954) Koratha, 1955
* New record on *Mugil cephalus* L. (Mugilidae) from Moreton Bay, Queensland.

- HETERAXINIDAE Price, 1962
 HETERAXININAE Unnithan, 1957
- Kannaphallus* Unnithan, 1957
104. *K. virilis* Unnithan, 1957
 * New record on *Caranx speciosus* (Forsk.) (Carangidae) from Heron Island, Queensland.
- GONOPLASIINAE Price, 1962
- Gonoplasius* Sandars, 1944
105. *G. carangis* Sandars, 1944
 Sandars (1944) on *Caranx georgianus* Cuv. and Val. (Carangidae) from North Beach, Rockingham, W. Australia.
- PYRAGRAPHORIDAE Yamaguti (1963)
- Pyragraphorus* Sproston, 1946
106. *P. pyragraphorus* (MacCallum and MacCallum, 1913)
 Sproston, 1946
 * New record on *Trachynotus bottla* (Shaw) (Carangidae) from Heron Island and Moreton Bay, Queensland.
- GASTROCOTYLIDAE Price, 1943
 THORACOCOTYLINAE Price, 1936
- Pseudothoracocotyle* Yamaguti, 1963
107. *P. scomberomori* Young, 1968
 Young (1968c) on *Scomberomorus commersoni* (Lacépède) (Scombridae) from Green Island and Heron Island, Queensland.
- GOTOCOTYLINAE Yamaguti, 1963
Gotocotyle Ishii, 1936
108. *G. elagatis* Meserve, 1938
 Sandars (1947) (as *Pseudomicrocotyle elagatis*) on *Elagatis bipinnulatus* (Quoy and Gaimard) (Carangidae) from Moreton Bay, Queensland.
109. *G. secunda* (Tripathi, 1956) Yamaguti, 1963
- * New record on *Scomberomorus commersoni* (Lacépède) (Scombridae) from Green Island and Heron Island, Queensland.
110. *G. bivaginalis* (Ramalingam, 1961) comb. nov.
 * New record on *Scomberomorus commersoni* (Lacépède) (Scombridae) from Green Island, Queensland.
- Pricea* Chauhan, 1945
- PRICEINAE Chauhan, 1945
111. *P. multae* Chauhan, 1945
 * New record on *Scomberomorus commersoni* (Lacépède) (Scombridae) from Green Island and Heron Island, Queensland.
- ALLADISCOCOTYLIDAE Tripathi, 1959
 ALLADISCOCOTYLINAE Tripathi, 1959
- Gemmaecaputia* Tripathi, 1959
112. *G. australis* Young, 1968
 Young (1968d) on *Sphyraena obtusata* Cuv. and Val. (Sphyraenidae) from Moreton Bay, Queensland.
- Winkenthughesia* Price, 1943
113. *W. thrysites* (Hughes, 1928) Price, 1943
 Hughes (1928) on *Thysites atun* (Gempylidae) from San Remo, Victoria.
- VALISIINAE Price, 1943
Vallisiopsis Subhapradha, 1951
114. *V. sphyraenis* Young, 1968
 Young (1968d) on *Sphyraena obtusata* (Cuv. and Val.) (Sphyraenidae) from Moreton Bay, Queensland.
- Genus of uncertain family
Anoplocotyle Palombi, 1943
115. *A. australis* (Johnston, 1930) Palombi, 1943
 Johnston (1930) on *Sparus australis* (Sparidae) from Sydney Harbour, New South Wales.

DISCUSSION

The biological fauna of Queensland marine waters constitutes part of the southern border of a vast zoogeographical area which encompasses the Red Sea to South Africa in the west; the Korean Strait and Japan in the north-east; Hawaii, the Marquesas Islands and the Tuamotu Archipelago in the east and Australia in the south. The Australian members of this Indo-Australasian fauna are found from Shark Bay in Western Australia to Cape York—the Damerian Region; and from Cape York to Sydney in New South Wales—the Solanderian Region.

The region from Shark Bay southwards across South Australia to Sydney is characterized by a temperate fauna (the Flindersian and Peronian regions) and the southerly limit of the warm water forms is at 29°S and no distinct subtropical fauna appears to be present (Figure 1).

The present records bring the number of monogenoid species recorded from Australia up to 115 belonging to 56 distinct genera. Seven genera are restricted to fresh waters; these are *Ancylodiscus*, *Datreosoma*, *Empleurosoma*, *Murraytrema*, *Protogyrodactylus*, *Trivitellina* and *Lepidotrema*. One genus, *Diplectanum*, has representatives from both marine and freshwaters; one genus, *Hamatopeduncularia*, is restricted to estuarine conditions; and the remaining 47 genera are found in marine waters only.

Marine genera found in Australia may be divided into groups.

- (i) Those from the Indo-Australasian element of the fish fauna;
- (ii) Those from the Southern Temperate fauna; and
- (iii) Those found in both areas.

(i) *Marine genera belonging to the Indo-Australasian element of the fish fauna (Solanderian and Damerian Regions)* — 34 genera

This group includes 9 genera unique to Australia; *Isohaliotrema*, *Hareocephalus*, *Latericaecum*, *Monoplectanum*, *Decacotyle*, *Troglecephalus*, *Clemacotyle*, *Pseudoleptobothrium* and *Anoplocotyle*. The remaining genera have species both in the Solanderian region and also in other parts of the world. These are: *Cleithrarticus*, *Haliotrema*, *Nasobranchiatrema*, *Pseudohaliotrema*, *Tetrancistrum*, *Acleotrema*, *Calydiscoides*, *Monocotyle*, *Heterocotyle*, *Horricauda*, *Papillicotyle*, *Dendromonocotyle*, *Dionchus*, *Caballerocotyle*, *Dioncopseudobenedenia*, *Entocyllabe*, *Aspinatrium*, *Metamicrocotyle*, *Kannaphallus*, *Pyragraphorus*, *Pseudothoracocotyle*, *Gotocotyle*, *Pricea*, *Gemmaeputia*, *Vallisiopsis*. Of all these, 11 are restricted to the Indo-Australasian region but 14 have been found in zoogeographically unrelated areas.

(ii) *Marine genera belonging to the Southern Temperate fauna (Flindersian and Peronian Regions)*

— 8 genera

This group includes 2 genera unique to Australia; *Gymnocaliocotyle* and *Megacillida*. The remaining 6 genera are: *Ancyrocephalus*, *Diplasiocotyle*, *Erpocotyle*, *Gonoplasius*, *Megalocotyle* and *Winkenthughesia*. Of these, *Megalocotyle* and *Ancyrocephalus* are genera in great need of revision as they both contain many species of doubtful affinities and cannot at present be considered as complete or distinct genera. *Gonoplasius* and *Diplasiocotyle* are found only in Australia and New Zealand, and *Win-*

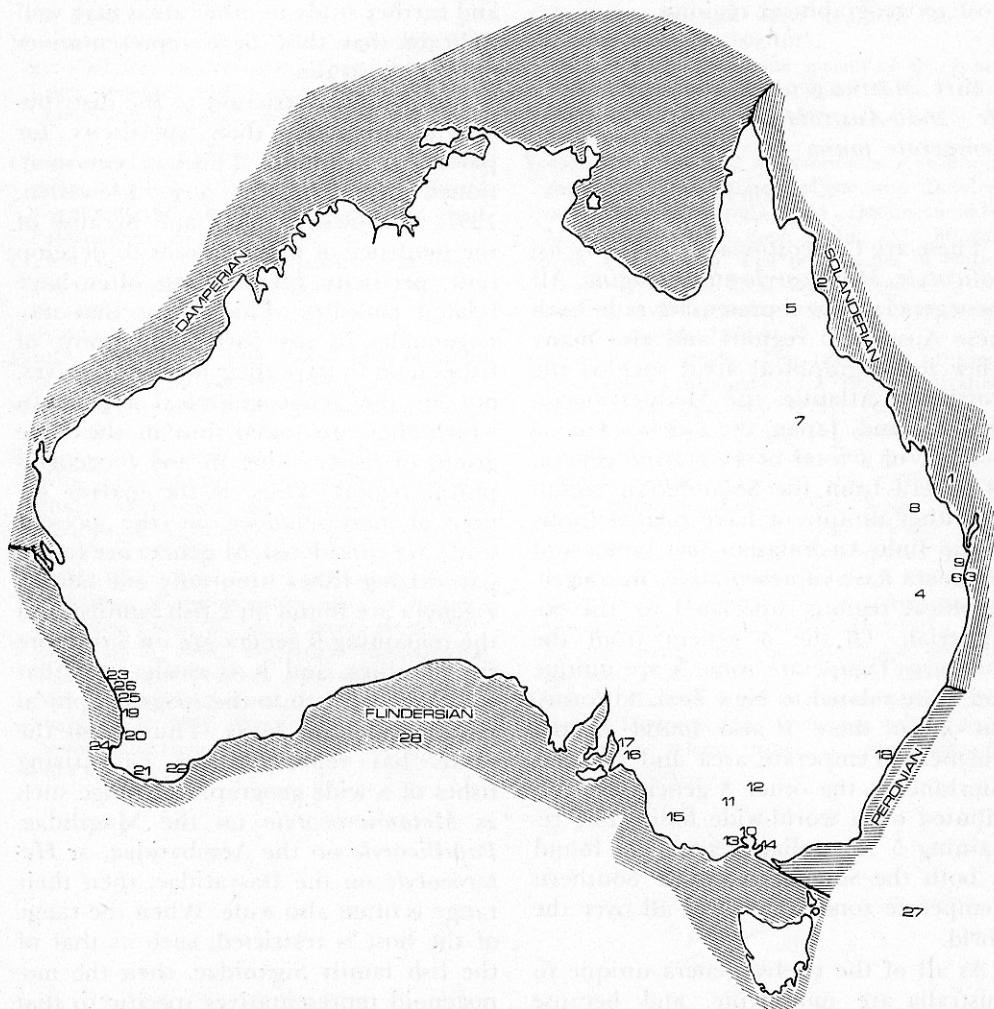


Fig. 1. Australia, showing zoogeographical areas and positions from which Monogenoidea have been reported. *Queensland*: 1, Heron Island; 2, Green Island; 3, Moreton Bay; 4, Macintyre River at Goondiwindi; 5, Atherton Tableland; 6, Brisbane, Enoggera Reservoir; 7, Thompson River at Longreach; 8, Burnett River; 9, Caloundra. *Victoria*: 10, Port Philip Bay; 11, Campaspe River; 12, Murray River; 13, Werribee River; 14, San Remo; 15, Glenelg River. *South Australia*: 16, Adelaide; 17, Glenelg. *New South Wales*: 18, Sydney. *Western Australia*: 19, Mandurah; 20, Bunbury; 21, Denmark; 22, Albany; 23, Perth (North Beach, Woodman Point, Scarborough, Witford's Beach, Nedlands); 24, Brusselton; 25, Safety Bay; 26, Rockingham. *Ocean Areas*: 27, Tasman Sea; 28, Great Australian Bight.

kenthughesia is found in Australia, New Zealand and also in the North Sea and Mediterranean. *Erpocotyle* is found in most zoogeographical regions.

(iii) *Marine genera belonging to both the Indo-Australasian and Southern Temperate fauna*

— 5 genera

These are *Calceostoma*, *Lamellodiscus*, *Calicotyle*, *Microcotyle* and *Bivagina*. All these genera have representatives in both these Australian regions and also many other zoogeographical areas such as the North-east Atlantic, the Mediterranean, New Zealand, Japan, the Celebes, etc.

Thus, of a total of 47 marine genera, 20 genera from the Solanderian region are either unique or have related forms in the Indo-Australasian fish fauna and 14 genera have representatives in zoogeographical regions unrelated to the Solanderian. Of the 8 genera from the Southern Temperate zone, 3 are unique and 2 are related to New Zealand forms, but one of these is also found in the Northern Temperate area and the Mediterranean; the other 3 genera are distributed on a world-wide basis. The remaining 5 Australian genera are found in both the Solanderian and Southern Temperate zones as well as all over the world.

As all of the twelve genera unique to Australia are monotypic, and because eight of these were described recently by the present author (Young, 1967a, 1967b,

1967c, 1968a, 1968b, 1968c, 1968d, 1969), it is unreasonable to assume that more species in these genera will not be found, and further study in other areas may well indicate that they have representatives outside Australia.

An obvious restriction to the distribution of genera is their specificity for particular fish hosts. This has been mentioned often before (e.g. Llewellyn, 1957; Bychowsky, 1957) and because of the tendency of monogenoids to develop host specificity, related hosts often have related parasites. This means that monogenoidea in any particular group of fishes tend to have their nearest relatives, not in the zoogeographical region in which they are found, but in the same group of fishes living in any zoogeographical region. Thus, if the marine genera of monogenoidea in the present study are considered, 31 genera are found parasitizing fishes from only one family, 7 genera are found on 2 fish families and the remaining 9 genera are on 3 or more fish families, and it is easily seen that the parasites fit into the zoogeographical patterns of their hosts. Thus when the genus has representatives parasitizing fishes of a wide geographical range such as *Metamicrocotyle* on the Mugilidae, *Papillicotyle* on the Aetobatidae, or *Heterocotyle* on the Dasyatidae, then their range is often also wide. When the range of the host is restricted, such as that of the fish family Siganidae, then the monogenoid representatives specific to that family are similarly restricted (Young, 1967).

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